



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/597,561

07/14/2008

Karni Volovelsky

26/832

2928

44696

7590

02/03/2012

DR. MARK M. FRIEDMAN

Moshe Aviv Tower, 54th Floor, 7 Jabotinsky St.

Ramat Gan, 52520

ISRAEL

EXAMINER

CHU, RANDOLPH I

ART UNIT

PAPER NUMBER

2624

NOTIFICATION DATE

DELIVERY MODE

02/03/2012

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patents@friedpat.com

friedpat.uspto@gmail.com

nomi\_m@friedpat.com

<b>Office Action Summary</b>	<b>Application No.</b> 10/597,561	<b>Applicant(s)</b> VOLOVELSKY ET AL.	
	<b>Examiner</b> RANDOLPH I. CHU	<b>Art Unit</b> 2624	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 12/29/2011.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 5) ☒ Claim(s) 7-12 is/are pending in the application.
- 5a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 6) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 7) ☒ Claim(s) 7,9 and 10 is/are rejected.
- 8) ☒ Claim(s) 8,11 and 12 is/are objected to.
- 9) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 12) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. ____.                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date ____.  | 6) <input type="checkbox"/> Other: ____.                          |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 7 and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Irani et al. ("Motion Analysis for Image Enhancement: Resolution, Occlusion and Transparency", and transparency", Jour. Visual Communication and Image Representation, Vol. 4, Dec. 1993, pp 1-24).

With respect to claim 7, Irani et al. teach

(a) for each sampled image (page 8,  $g_k$ ), defining:

(i) a transformation operator  $F$  mapping positions within the master image to corresponding positions in the sampled image (page 8,  $T_k$ ),

(ii) a distortion operator  $H$  simulating a distortion associated with an imaging sensor from which the sampled image was generated (page 8,  $h$  (blurring operator)), and

(iii) a sampling operator  $D$  for reducing an image from the output resolution to the resolution of the sampled image (page 8,  $\sigma_x$ );

(b) for each sampled image, applying said transformation operator, said distortion operator and said sampling operator to a current master image hypothesis so as to generate a predicted image, and calculating a difference image having pixel values corresponding to the difference in corresponding pixel values between the sampled image ( $g_x$ ) and the predicted image ( $g_x^{(0)}$ ) (page 9, The Super-resolution algorithm);

(c) performing back-projection of each of said difference images to generate a correction image for the current master image hypothesis ( $f^{(0)}$ ) (page 9, The Super-resolution algorithm); and

(d) employing said correction images to perform a correction to the current master image hypothesis to generate a new master image hypothesis ( $f^{(1)}$ ) (page 9, The Super-resolution algorithm);

wherein said back projection includes employing an operator  $H^{bp}$  corresponding to a pseudo-inverse of distortion operator  $H$ , wherein  $H^{bp}$  approximates to an inverse of  $H$  at spatial frequencies below a given value and approaches zero at spatial frequencies above said given value (page 10,  $F_x^{-1}$ ).

With respect to claim 10, Irani et al. teach that distortion operator  $H$  corresponds to a modulation transfer function describing only a first portion of a distortion generated by the imaging sensor, the method further comprising a post-processing step of deconvoluting a final master image hypothesis to substantially correct a modulation

Art Unit: 2624

transfer function describing a remainder of a distortion generated by the imaging sensor (pages 8-10,  $\mathbb{H}$  (blurring operator)).

***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 9 is rejected under 35 USC 103(a) as being unpatentable over Irani et al. ("Motion Analysis for Image Enhancement: Resolution, Occlusion and Transparency", and transparency", Jour. Visual Communication and Image Representation, Vol. 4, Dec. 1993, pp 1-24) in view of Ahiska (US 2009/0102950).

Irani et al. teach all the limitations of claim 7 as applied above from which claim 9 respectively depend.

Irani et al. do not teach expressly that distortion operator  $H$  corresponds to a combination of a modulation transfer function resulting from an optical system of the imaging sensor and a modulation transfer function resulting from a distortion generated by a sensor element array of the imaging sensor.

Ahiska teaches distortion operator  $H$  corresponds to a combination of a modulation transfer function resulting from an optical system of the imaging sensor and

Art Unit: 2624

a modulation transfer function resulting from a distortion generated by a sensor element array of the imaging sensor (para [0027]).

Irani et al. and Ahiska are analogous art because they are in the “same field of endeavor”, image processing.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use distortion operator that is combination of optical distortion and sensor distortion in the method of Irani et al.

The suggestion/motivation for doing so would have been that to correct various types of distortions.

Therefore, it would have been obvious to combine Ahiska with Irani et al. to obtain the invention as specified in claim 9.

### **Allowable Subject Matter**

3. Claims 8, 11 and 12 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Randolph Chu whose telephone number is 571-270-1145. The examiner can normally be reached on Monday to Thursday from 7:30 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vu Le can be reached on 571-272-7332. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/RANDOLPH I CHU/

Primary Examiner, Art Unit 2624